In this issue of our journal we present articles based on the Proceedings of the 6th Scientific and Practical Applications Conference on the Prospects for Advancement of the Ceramic Industry, held at the Exhibition Complex "Ékspostroi na Nakhimovskom" as part of the 17th exhibition – fair "Ékspostroi-2008. Building Services. Home Interiors."

In the last few years, our domestic ceramics industry has steadily increased production volumes of high-quality product, demand for which has been growing continually. However, the industry has more than a few problems, whose solution largely depends on the consolidated actions taken by specialists within the ceramics industry, suppliers of raw materials and equipment, as well as, of course, the efforts of industry scientists. This made the next scientific and applications conference topical and timely.

The questions which are of greatest importance to the ceramics industry were examined at the conference: improvement of the production of ceramic articles, new domestic and imported equipment, reconstruction and upgrading of operating facilities.

The conference participants devoted a great deal of attention to questions concerning raw materials — expansion of the raw materials base for the production of ceramics, providing ceramics works with high-quality raw materials, new technologies for preparing raw materials, and utilization of technogenic wastes.

This conference was of great interest for those working in the industry, scientific – research and design organizations, and equipment developers, and raw materials suppliers.

WASTES IN PRODUCTION

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PRODUCTION OF CONSTRUCTION MATERIALS USING TECHNOGENIC WASTES

V. F. Rasskazov,[1] G. D. Ashmarin,[1] and A. N. Livada[1]

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The utilization of technogenic wastes, first and foremost, wastes produced in the mining and reprocessing industries, and precipitates from biological purification of sewage at aeration plants in cities and waste water from works producing large quantities of building materials, such as ceramic bricks and cement, can provide a solution to acute ecological and technical problems in the building materials industry.

The utilization of technogenic wastes produced by, first and foremost, mining and reprocessing works, and precipitates from biological purification of sewage in aeration plants (PBPS AP) in cities and plants producing large quantities of building materials, such as ceramic bricks and cement, can provide a solution to the acute ecological and technical problems in the building materials industry in our country.

Shortages of high-quality raw materials which make it possible to produce products that meet the requirements of the market are increasingly arising in the production of materials for building walls — bricks and cement — as well as other ceramic articles. At the same time, hundreds of millions of metric tons of finely disperse, protein-containing PBPS AP, wastes from the production and enrichment of carbon, wastes from the chemical industry (phosphogypsum), and other types of wastes have accumulated and are continuing to accumulate over extensive territories. The source of raw materials, which is very valuable for the ceramics industry, burdens our country's budget with expenditures on storage and environmental protection because of the absence of support by the government and corporations for technologies

[1] P. P. Budnikov All-Russia Scientific – Research Institute for Building Materials and Construction, Moscow, Russia.

which would make it possible to utilize such wastes. The general application of technologies which would make it possible to utilize industrial wastes in the production of ceramic materials will not only remove burdensome expenditures from the budget but it will also provide a large stimulus for expanding the production of building materials and make possible the advancement of the ceramics industry as a whole.

At the same time Russian ceramicists meeting at the 6th Scientific – Applications Conference in Moscow noted that the Russian building industry is entirely dependent on foreign suppliers of the complete technological equipment sets and spare parts for operating enterprises, as well as those which are under construction, that produce a large assortment of ceramic articles. Russian manufacturers of ceramic articles, who lost the machine-engineering and industrial base during perestroika years, now possess only meager capabilities for manufacturing individual equipment, which is not part of a set, at their own manufacturing facilities and do not possess adequate means for ordering equipment from machine-building enterprises in the Russian Federation. In our country, the lack of a machine-engineering base capable of producing complete technological lines, equipment, and spare parts for ceramic works is explained by an incomplete, poorly organized control structure, and the lack of financial means for expanding production and adopting new and progressive technologies.

The use of coal wastes in phosphogypsum and PBPS AP in the ceramic industry by utilizing autoclave, ceramic brick, cement, cement clinker, and sulfuric acid (RF Patents Nos. 1828459, 2082692, 2284307, 2285676, 2296723, and others) in production is, in our view, an urgent government problem.

Coal wastes, containing up to 25% carbon, are at the same time semi-acidic clays, i.e. a high-quality raw materials for the production of highly effective porous-hollow ceramic wall materials with high heat-protection properties. There is a real possibility of decreasing gas consumption on sintering articles by 80%.

Phosphogypsum is already used in a number of European counties as a raw material in the production of cement and sulfuric acid by the Mueller – Kuehne (US Patents Nos. 1069191 and 3865602) technology. It has been proposed that a technology for obtaining Portland cement clinker and sulfuric acid that is distinguished by its know-how, consisting in the fact that phosphogypsum and PBPS AP are used instead of clay raw material and coal (carbon), be adopted in our country. Using PBPS AP, having moisture content 81% and the capacity to produce $(11 – 18) \times 10^3$ kJ/kg dry material heat, in the production of Portland cement clinker permits decreasing under production conditions the consumption of heat carriers — gas or coal — by at least 30% as compared with the USA-patented technology.

As a result of commercial tests performed at works in Odessa, Sumy, Moscow, and Kuchino (Moscow oblast'), batches of ecologically clean silicate and ceramic brick with high user characteristics were obtained. For example, the mass of the M100 16-slit facing brick with the standard dimensions, produced on the French line in "Interneftegasstroi" JSC works in Kuchino was 2025 – 2080 g, and the thermal conductivity of the brick was 0.275 W/(m · K). The PBPS AP content ranged from 20 to 50%, the formation moisture content from 22.5 to 23.6%, the formation pressure from 1.6 to 1.8 MPa, and the sintering temperature was 896°C.

Calculations show that the cost of building a brick works with capacity 250×10^6 bricks/year — 40×10^6 $US — is recouped in 1.5 year with reprocessing of 886,000 tons/year raw material. No more than 218,750 tons PBPS AP can be reprocessed in Moscow and Moscow oblast'.

Thus, building brick works and works which produce Portland cement clinker and sulfuric acid using the technogenic wastes indicated above will make it possible to solve the ecological problem of salvaging these wastes, and achieving a large economic gain in the process.

The new wall building materials and building works using new technologies will make it possible to solve at the same time ecological environmental problems, social problems of providing employment for the general public by creating new jobs and supplying the market with a wide range of building materials.

Undoubtedly, government support in solving problems such as the development of a promising plan for developing the building materials industry in the near term is necessary to solve these problems. Such a plan would include the following:

building modern process lines for the production of ceramic wall materials with capacity 30, 60, and 75 million brick equivalents per year;

organizing the production of domestic equipment for the production of ceramic wall materials and spare parts for this equipment;

developing a technology for producing highly effective porous-hollow large-dimension ceramic blocks, cement clinker, and sulfuric acid using wastes from the production and enrichment of carbon and PBPS AP;

developing equipment for process lines producing wall materials, cement clinker, and sulfuric acid using technogenic wastes; and,

developing a program for building works for the production of wall materials, cement clinker, and sulfuric acid in the ecologically most problematic regions of the country, such as the Moscow and St. Petersburg megalopolises and other large regional centers with industrial cities.